CHAPTER ONE

OVERVIEW OF DOD MANUFACTURING MANAGEMENT

CONTENTS

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OBJECTIVE

Manufacturing (production) is the conversion of raw materials into products and/or components thereof, through a series of manufacturing procedures and processes. It includes such major functions as manufacturing planning and scheduling; manufacturing engineering; fabrication and assembly; installation and checkout; demonstration and testing; product assurance; and determination of resource requirements.

Manufacturing management is the technique of planning, organizing, directing, controlling and integrating the use of people, money, materials, equipment, and facilities to accomplish the manufacturing task economically. A manufacturing management system is composed essentially of three phases: planning, analysis, and control.

1. During the planning phase, consideration must be given to such factors as material acquisition, an adequate work force, the engineering design, and provisions for sub-contractor support. Production feasibility and producibility of the engineering design are critical factors that must be considered early in a program. This consideration must include planning, new processes, facilities, tools and test equipment, and cost control during design.

2. During the analysis phase, answers must be provided to such questions as: Is the manufacturing process working? Is it efficient? Is manufacturing being accomplished by the most economical method? Is the manufacturing plan being followed and are the established goals being met? (During system design and development, these questions need to be projected into the future manufacturing effort to identify required preparatory actions and to assess risks.)

3. During the control phase, the manufacturing effort must be monitored to ensure that the manufacturing management function is performing within the constraints and limits that have been established.

Throughout all these phases, an essential element is the role of the manufacturing manager and the organizational environment under which he operates. The focus of this chapter is on the organizational structures within DOD and the nature of the assignment of responsibility for manufacturing management tasks within that structure. There is also consideration of the nature of the relationship between the program manager and the industry counterpart organizations. The successful completion of a program requires that an effective working relationship be established, with mutual understanding of the responsibilities of each.

INTRODUCTION

The objectives of DOD manufacturing management are:

1. To ensure that proper manufacturing planning has been accomplished early in a program so that the manufacturing effort will be performed smoothly.

2. To ensure that the system design will lead to efficient and economical quantity manufacture.

3. To assess the status of the program at any point during the production phase to determine if schedule, costs, and quality standards are being met.

4. To conduct assessments and reviews of the manufacturing effort required to meet decision points at each phase of a defense systems acquisition program.

One of the basic thrusts within DOD is to increase management focus on manufacturing and total quality management during early defense system (weapon) program phases. There are significant costs associated with the manufacturing effort. These costs, to a great degree, are inherent in the design. As a design evolves, certain costs become essentially fixed. Given the objective of minimizing cost and the existence of projections that indicate limited dollars available for future manufacturing effort, it will be necessary to identify costs at the point

when they are being fixed. This situation provides the need for early assessment.

ORGANIZATIONAL STRUCTURE

The Undersecretary of Defense for Acquisition has the direct responsibility for DOD manufacturing management policy and guidance in the acquisition of defense systems. The head of each DOD component (Military Departments and Defense Agencies), in turn, is responsible for developing and implementing procedures within the components. Figure 1-1 depicts the variation of the command structures for defense system acquisition within the components.

DOD Directive 5000.1, Major and Non-Major Defense Acquisition Programs, establishes the approval cycle and procedures for weapon system acquisition. The directive applies to the staff of the Secretary of Defense, the Military Departments, the Organization of the Joint Chiefs of Staff, the Unified and Specified Commands, Defense Agencies, including The Strategic Defense Initiative Organization, and DOD Field Activities or Components.

The Directive establishes the Undersecretary of Defense for Acquisition as the Defense Acquisition Executive (DAE). The DAE is charged with assuring that the manufacture of each weapon system is performed so as to produce the most efficient, cost-effective, and highest quality end item possible. He does this through his role as the Chairman of the Defense Acquisition Board (DAB). The DAB (vice-chaired by the recently created Vice Chairman of the Joint Chiefs of Staff who assures that requirements are met) provides approval, policy guidance and issues resolution as the weapon system moves through the acquisition cycle from: Milestone O - Program Initiation/Mission-Need Decision; Milestone I - Concept Demonstration/Validation Decision; Milestone II - Full-Scale Development Decision; Milestone III - Full Rate Production Decision; Milestone IV - Logistics Readiness and Support Review; and Milestone V - Major Upgrade or System Replacement Decision. (See Chapter 3 for discussion of the acquisition process.) The Undersecretaries of the Army and Navy and the Assistant Secretary for Acquisition for the Air Force serve as Service Acquisition Executives (SAE) for their respective components. The individual SAEs manage the established acquisition structure and process within their component, consistent with DOD guidance; report breaches to the program baselines; and establish policy for managing component programs.

Authority for acquisition management is assigned in a three tier management structure recommended by the President's Blue Ribbon Commission on Defense Management (better known as the Packard Commission). Within this structure, program managers report to Program Executive Officers (PEOs) who report to the SAE, as shown in Figure 1-2. In responding to this requirement (from the Goldwater-Nichols Department of Defense Reorganization Act), each of the Services has structured acquisition policy and program execution organizations somewhat differently.

The Army has a single command, the Army Materiel Command (AMC) that accomplishes all the research, development, acquisition and logistics support functions. Within AMC, the Chief of Staff for Production provides manufacturing management guidance to the Major Subordinate Commands (MSCs). The MSCs such as Aviation Systems Command, Missile Command, Tank-Automotive Command or Test and Evaluation Command manage the specific research, development, acquisition, test and support for each assigned weapon system within their respective program management office.

The Navy's principal subordinate Systems Commands (SYSCOMs), i.e., Naval Sea Systems, Naval Air Systems, Space and Naval Warfare, Naval Mine Warfare, Naval Supply Systems, and Naval Facilities Engineering are responsible for providing material support for the operating needs of the Navy and for certain Marine Corps needs. The SYSCOMs report directly to the Chief of Naval Operations. The program offices within the SYSCOMs are responsible for the manufacturing management functions for the defense systems under development. However, guidance on transitioning from development to production comes from the Assistant Secretary of the Navy for Ship Building and Logistics.

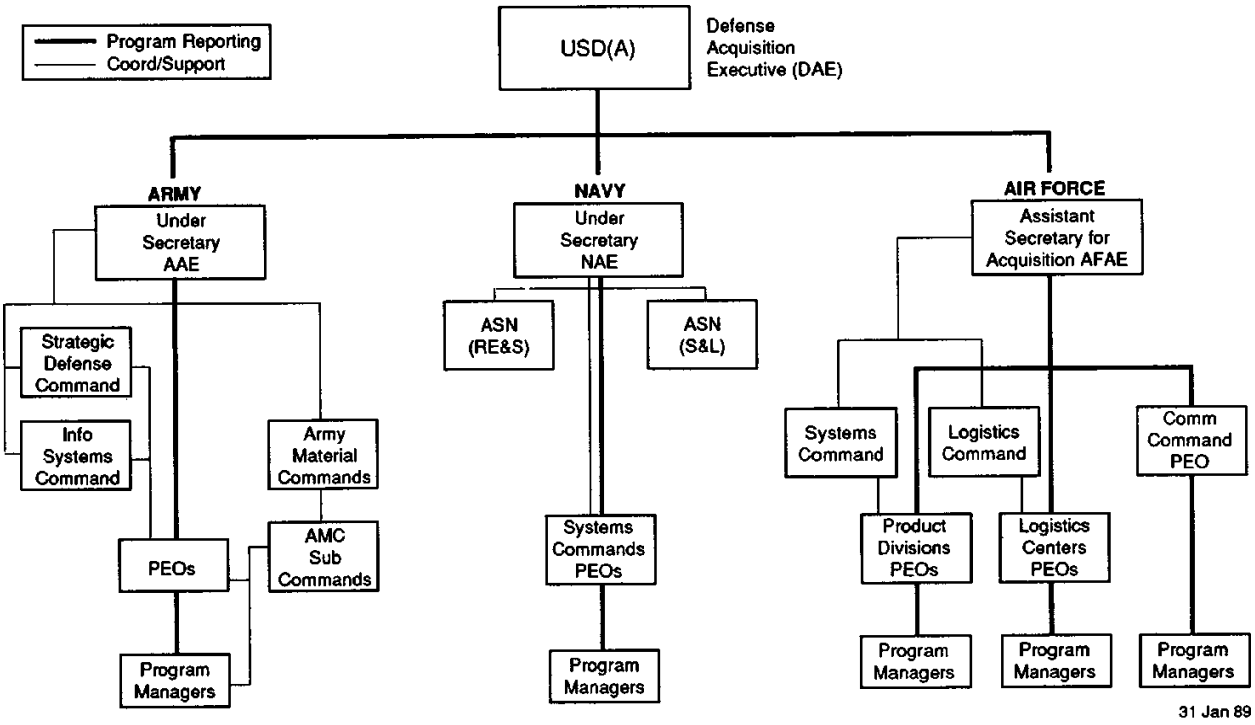

Figure 1-1 Program Manager's Reporting Chain

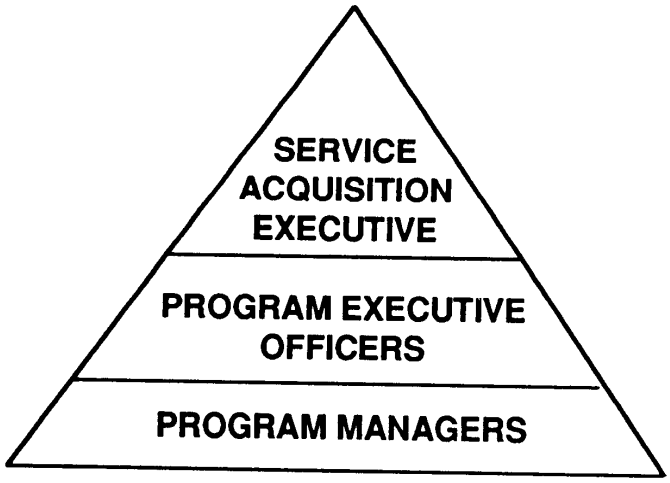

Figure 1-2 Acquisition Management Structure

Responsibility for manufacturing policy within the Air Force is held by the Director of Contracting and Manufacturing Policy within the Office for the Assistant Secretary of Acquisition. The Air Force has two major commands concerned with the defense systems acquisition process, the Air Force Systems Command (AFSC) and the Air Force Logistics Command (AFLC). AFSC, through the Deputy Chief of Staff/Product Assurance and Acquisition Logistics, is responsible for the manufacturing function. AFLC, through the Deputy Chief of Staff/ Contracting and Manufacturing is responsible for the manufacturing function after the program management responsibility is transferred from AFSC to AFLC.

OSD AND DOD COMPONENT RESPONSIBILITIES

As stated previously, DOD Directive 5000.1, Major and Non-Major Defense Acquisition Programs, gives the Undersecretary of Defense for Acquisition, as the DAE, the responsibility to establish manufacturing policy and direction. Policy emphasis is placed on long range planning and effective requirements which allow for smooth transition from development to production. The guidance includes such areas as production planning, transition to production, concurrent engineering, total quality management, could cost, and manufacturing technology. The DAE passes this policy through the respective SAEs, who are the senior acquisition executives within the DOD component having cognizance and management responsibility over defense systems. The manufacturing policy is assessed by the components' PEO and is provided to the program managers. The PEOs are the officials responsible for administering a defined number of acquisitions and reporting program status to the SAE. The concept behind this approach is that the acquisition system will be characterized by short, direct lines of communications; less staff interaction; and streamlined procedures. Overall the program manager, who is the individual responsible for executing the program, will experience fewer layers of management oversight (no more than one management tier between the PM and the SAE), and will be able to receive the guidance he requires in a timely fashion.

In addition, OSD chartered in the summer of 1988 a Defense Manufacturing Board (DMB) similar to the Defense Science Board. This group of senior personnel from government, defense and non-defense industry, labor and academia will provide analysis and advice to OSD on manufacturing issues and will aid in evaluating the effectiveness of new policies and initiatives. The Board will also develop approaches to apply innovative technology throughout the manufacturing industry; improve quality in manufacturing processes, primarily through the concept of Total Quality Management; and increase the use of concurrent engineering -designing the product and its manufacturing processes at the same time. The initial term of the DMB is two years. At that time, a decision will be made as to the Board's future.

DOD Directive 4245.6, Defense Production Management, establishes policy and assigns responsibility for manufacturing management within the DOD components for the acquisition of major defense systems. This direction is practical for programs of all magnitudes and is supplemented with more detail by the respective DOD components.

Major programs in each Service begin following SECDEF or Deputy SECDEF acceptance of the mission need statement (MNS). The justification contains an analysis that has taken into consideration the existing technology base. Manufacturing management is considered at each decision point throughout the system life cycle. A manufacturing feasibility assessment is made by the responsible DOD component during the development of the component/OSD decision leading to the concept demonstration/ validation phase. The producibility of the design approach and production risks are reviewed prior to the full-scale development phase. Toward the end of the full-scale development phase, a final Production Readiness Review is performed to determine whether the program is ready to enter the production and deployment phase.

GOVERNMENT PROGRAM MANAGER RESPONSIBILITIES

The government program manager (PM) needs to be concerned with manufacturing management early in the process of defense system acquisition. The design producibility, the manufacturing processes, the tooling to be developed, and production testing and demonstrations identified during preliminary design should be evaluated to determine the overall manufacturing risk, as well as cost and schedule impacts. Manufacturing risk is one of the

important factors in making the decision to proceed with the concept demonstration/validation phase and later with the full-scale development phase.

No later than the concept demonstration/validation phase, a producibility analysis should be made to aid in the identification of risks, the development of preliminary cost and schedule estimates, and the identification of issues that must be resolved prior to the Milestone II decision. Preparation for Production Readiness Reviews should begin in the concept demonstration/validation phase. The Program Management Office (PMO) should establish and provide criteria to the contractor as early as possible. A successful Milestone II requires a plan for transitioning from development to production. Milestone III requires verification of the product producibility and production schedule capabilities.

The PM should work closely with the contractor counterpart to ensure that all manufacturing objectives will be met. The PM should insist on aggressive producibility actions, comprehensive production planning and scheduling, and efficient manufacturing methods. Sufficient funds should be budgeted for use during the full-scale development phase to accomplish these tasks. Producibility engineering and planning (PEP) and initial production facilities (IPF) definition efforts should start during product design to avoid incurring significant cost and delays in starting the manufacturing effort.

The PM, through the manufacturing team in the PMO, should monitor progress against the manufacturing plan. The PMO team should have a good technical understanding of the product so that technical problems can be resolved and design modifications can be evaluated effectively. The PM, of course, must be aware of each contract and engineering change during the program, and the impact of that change on the overall program.

RELATIONSHIP BETWEEN GOVERNMENT AND CONTRACTOR PROGRAM MANAGERS

Interaction between contractor manufacturing executives and the government PM is required during program planning when program schedules and budgets are being established. This relationship should continue throughout the life cycle of the program. Such interaction usually results in the development of better schedule and cost planning. Also, it increases the validity of information used by the contractor(s) for work force, technology and capital expenditure planning.

Interaction is required in the review of work in process and the contractor methods and procedures. This assists both government and contractor managers in their understanding of the manufacturing proposals and in the expeditious resolution of manufacturing problems. This interaction is an absolute necessity, and in some cases the PM will find that interaction between the government and contractor manufacturing personnel can serve as a forcing function for the top contractor design personnel to communicate and coordinate program decisions with their own manufacturing personnel. A management tool like Award Fee can increase visibility into the interaction aspects of the producibility program.

When budgeting for manufacturing, interaction will enable the government PMO to determine the significant cost impacts experienced by the contractor. Interaction increases the government PMO's understanding of the contractor's manufacturing operations and manufacturing pricing methodology, as well as the factors that can impact manufacturing operations.

GOVERNMENT PROGRAM MANAGEMENT OFFICE PERSONNEL SELECTION

Personnel selected to perform the manufacturing management task in a government PMO should be production-oriented and should understand fully the importance of continuing assessment of the manufacturing effort. Knowledge of the following is important for government personnel to have or to develop when they are assigned the manufacturing management responsibility:

Manufacturing processes and their management.

Engineering operations.

The technical performance requirements of the defense system/product (as specified in the contract).

The DOD planning, programming, and budgeting cycle.

Manufacturing planning and scheduling.

The relationship of manufacturing management to acquisition strategy.

Configuration management and its relationship to the manufacturing effort.

Total quality management.

Depot maintenance or repair facility operations. How to control/reduce costs.

Productivity improvement.

TOTAL QUALITY MANAGEMENT AND COULD COST

The goals of Total Quality Management (TQM) and Could Cost are to improve the quality and lower the cost of system acquisitions. These require the commitment of the entire acquisition community. Attention must be focused on integrating the acquisition processes, reducing non-value- added work, and improving contractor performance.

There are many acquisition streamlining and quality initiatives which contribute to the TQM/Could Cost goals. By combining these initiatives with innovative thinking, a corporate strategy can be formulated that will achieve the goal of quality/cost improvements in DOD acquisitions.

The TQM/Could Cost philosophy can be integrated into the acquisition process through ongoing initiatives, encouraging future innovations which improve quality and reduce cost, and assuring that TQM/Could Cost tools and techniques are addressed in the planning and execution of acquisition programs.

Applying the TQM/Could Cost philosophy in the acquisition process will require a “cultural” change within DOD. To effect that change, a TQM Master Plan has been developed which concentrates on one fundamental objective: the continuous improvement of DOD products and services. To meet this objective there will also have to be full DOD and contractor participation and commitment. Some of the primary challenges in implementation of this concept are:

1. Foster an awareness of and commitment to the philosophy in the DOD acquisition community.

2. Work closely with industry to identify and remove barriers to quality/cost improvement and to develop acquisition incentives that encourage contractor performance improvements.

3. Identify, describe and develop tools and techniques that have a positive impact on quality and cost; integrate them into functional processes.

4. Integrate this philosophy into acquisition programs.

5. Assess the effectiveness of TQM and Could Cost implementation by evaluating functional and program performance improvements.

REFERENCE DOCUMENTS

Numerous reference documents impact the manufacturing management function throughout the acquisi-

tion process. These documents originate from many sources and range across academic disciplines, functional activities, and job specialties.

The following is a reference list of DOD Directives (D), Instructions (I) Manuals (M), Pamphlets (P) Military Standards (MS), and other documents. The documents listed contain DOD policy guidance applicable to the manufacturing management function. They are listed as sources of DOD manufacturing management information.

REFERENCE LIST

Number	Title
(D) 2000.9	International Coproduction Projects and Agreements
(I) 2010.4	U.S. Participation in Certain NATO Groups Relating To Research, Development, Production and Logistics Support of Military Equipment
(D) 2010.6	Standardization and Interoperability of Weapons Systems and Equipment Within the North Atlantic Treaty Organization
(I) 3235.1	Test and Evaluation of System Reliability, Availability and Maintainability
(D) 4005	Defense Acquisition Research
(D) 4005.1	Industrial Preparedness Production Planning
(D) 4005.16	Diminishing Manufacturing Sources and Material Shortages
(I) 4005.3	Industrial Preparedness Planning
(M) 4005.3-M	Industrial Preparedness Planning Manual
(H) 4105.59	HDOD Directory of Contract Administration Services
(I) 4120.20	Development and Use of Non-Government Specification and Standards
(D) 4120.3	Defense Standardization and Specification Program
(I) 4120.19	DOD Parts Control Program
(I) 4140.41	Government-Owned Materiel Assets Utilized as GFM for Major Acquisition Programs
(D) 4155.1	Quality Program
(I) 4155.20	Contractor Assessment Program
(D) 4160.22	Recovery and Utilization of Precious Metals
(I) 4200.15	Manufacturing Technology Program
(D) 4120.8	DOD Bill of Materials
(D) 4245.3	Design to Cost
(D) 4245.6	Defense Production Management
(D) 4245.7	Transition from Development to Production
(M) 4247.7-M	Transition from Development to Production Manual
(D) 4245.8	DOD Value Engineering Program
(H) 4245.8	DOD Value Engineering Program
(D) 4245.9	Competitive Acquisitions
(D) 4275.5	Acquisition and Management of Industrial Resources
(I) 4210.4	Studies on the Availability of Materials
(I) 4400.1	Priorities and Allocations
(D) 5000.1	Major and Non Major System Acquisitions
(I) 5000.2	Defense Acquisition Program Procedures
(D) 5000.3	Test and Evaluation
(D) 5000.29	Management of Computer Resources in Major Defense Systems
(I) 5000.38	Production Readiness Reviews
(D) 5000.39	Acquisition and Management of Integrated Logistic Support for Systems and Equip ments
(D) 5000.40	Reliability and Maintainability
(D) 5000.43	Acquisition Streamlining
(D) 5000.44	Industrial Modernization Initiatives Program
(D) 5000.45	Baselining of Selected Major Systems

(D) 5000.49	Defense Acquisition Board
(I) 5010.12	Management of Technical Data
(D) 5010.19	Configuration Management
(D) 5010.20	Work Breakdown Structures for Defense Material Items
(M) 5025.1-M	DOD Directives System Procedures Manual
(D) 5220.22	DOD Industrial Security Program
(I) 7000.2	Performance Measurement for Selected Acquisitions
(I) 7000.3	Selected Acquisition Reports
(I) 7000.10	Contractor Cost Performance, Funds Status, and Cost/Schedule Status Reports
(I) 7000.11	Contractor Cost Data Reporting (CCDR)
(I) 7045.7	The Planning, Programming, and Budgeting System
(I) 7220.31	Unit Cost Reports
(MS) 109B	Quality Assurance Terms and Definitions
(MS) 470	Maintainability Program Requirements (for Systems and Equipments)
(MS) 480	Configuration Control - Engineering Changes, Deviations and Waivers
(MS) 481A	Configuration Control - Engineering Changes (Short Form)
(MS) 482A	Configuration Status Accounting Data Elements
(MS) 490	Specification Practices
(MS) 499A	Engineering Management
(MS) 785B	Reliability Program for Systems and Equipment Development and Production
(MS) 881A	Work Breakdown Structures for Defense Material Items
(MS) 1521A	Technical Reviews and Audits for Systems, Equipments and Computer Programs
(MS) 1528A	Production Management
(MS) 1567A	Work Measurement
DOD-STD-1OOC	Engineering Drafting Practices
MIL-I-45208A	Inspection System Requirements
MIL-Q-9858A	Quality Program Requirements
(DCAA) P 7641.47	Cost/Schedule Control Systems Criteria Joint Implementation Guide